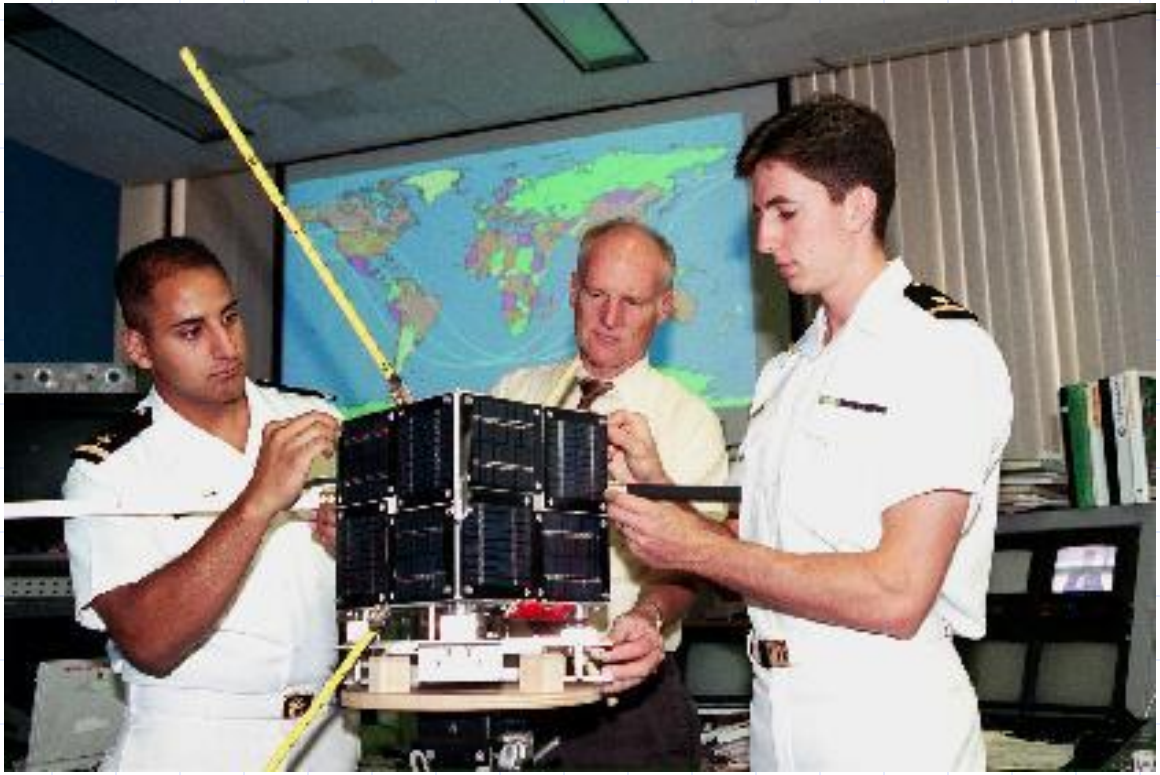
US Naval Academy Prototype Communications Satellite



Team: 6 Students, 3 Profs, 1 Engineer (1 HAM)

Over 1200 mobile Amateur Satellite Users

Prototype Communications Satellite

- A US Naval Academy Aerospace student project designed to give students real hands on experience in satellite design and operations.
- Funds by a Grant from Boeing Corp
- Launch through DOD's Space Test Program in cooperation with NASA.
- First of the USNA Small Satellite program
- Guidance of LTCL Billy Smith and Satellite Project Engineer, Bob Bruninga, WB4APR

PCsat Mission

- Data Relay for Mobiles and Handheld radios. GPS tracking and LIVE to WEB



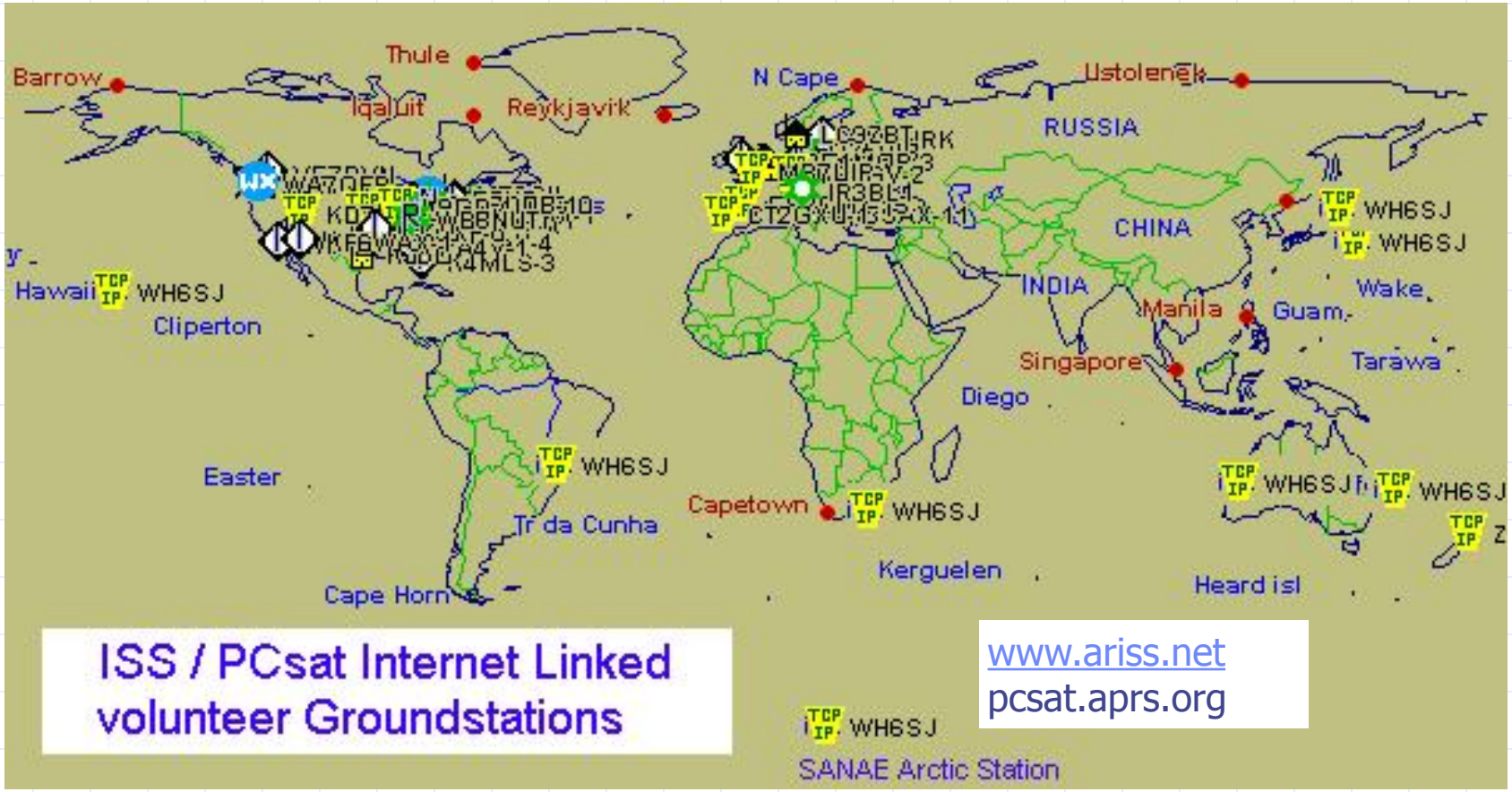
APRS Handheld and Mobile



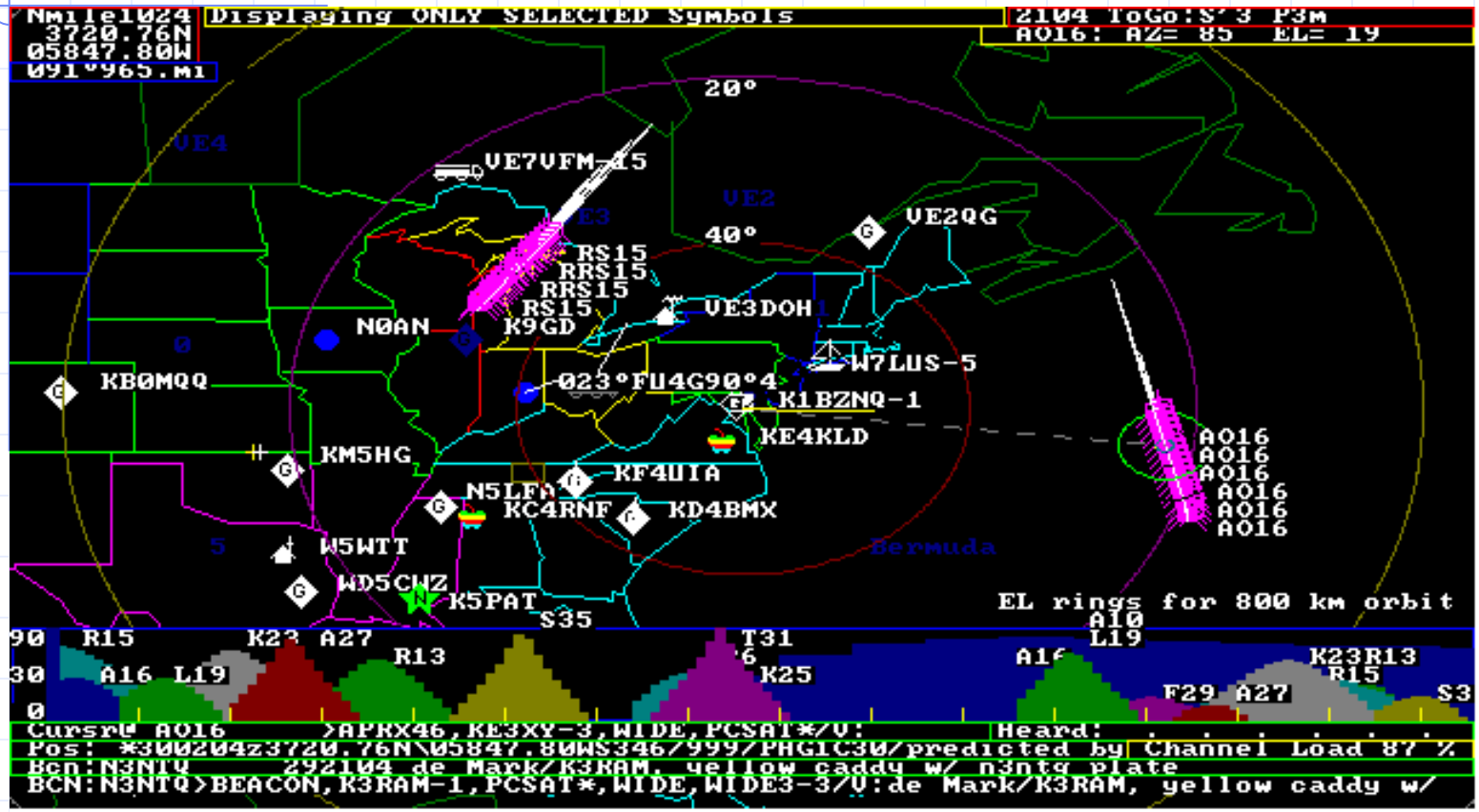
PCsat Operations



Worldwide Internet Linked Ground Stations



APRSdos MAP display



MAP display of APRS stations seen on-the-air

Map shows current position of all satellites

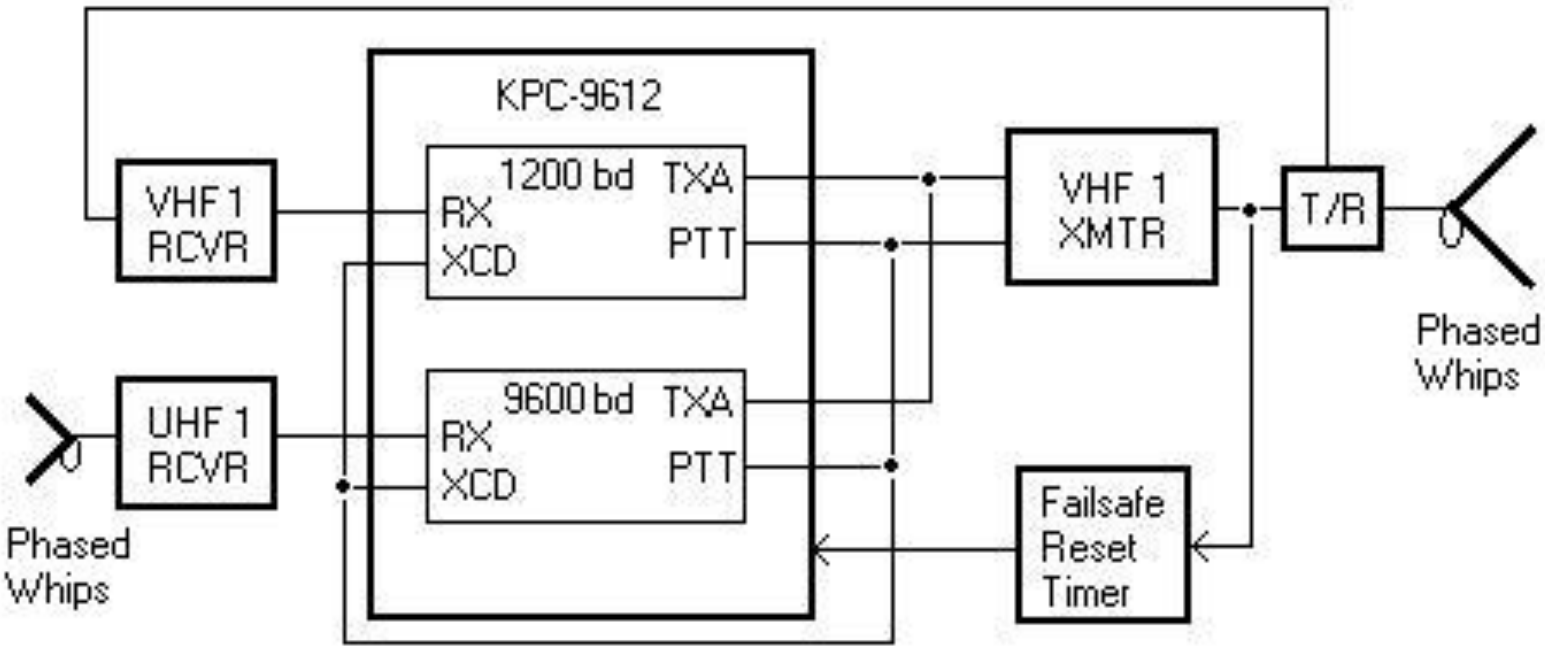
Rings show EL angle from own station

Next 2 hours of Passes. Shows max EL angle

All satellites are shown on the map as moving objects. Across the bottom of the screen the next 2.5 hours of satellite passes are shown in a graphic showing the maximum elevation of the pass.

PCsat Simplicity

- No CPU. Uses only two TNC's

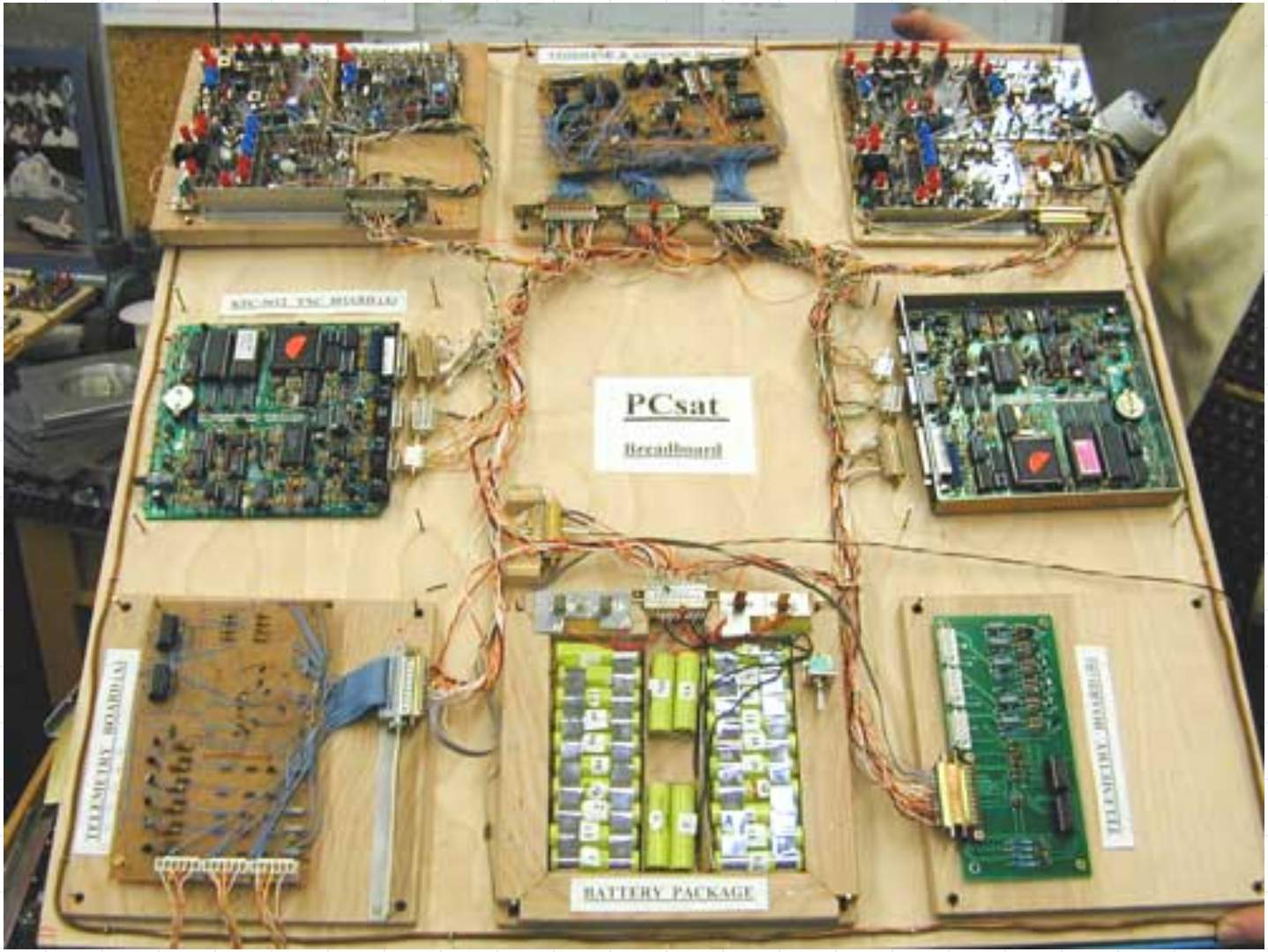


One of Two Identical TNC/XMTR/RCVR Systems

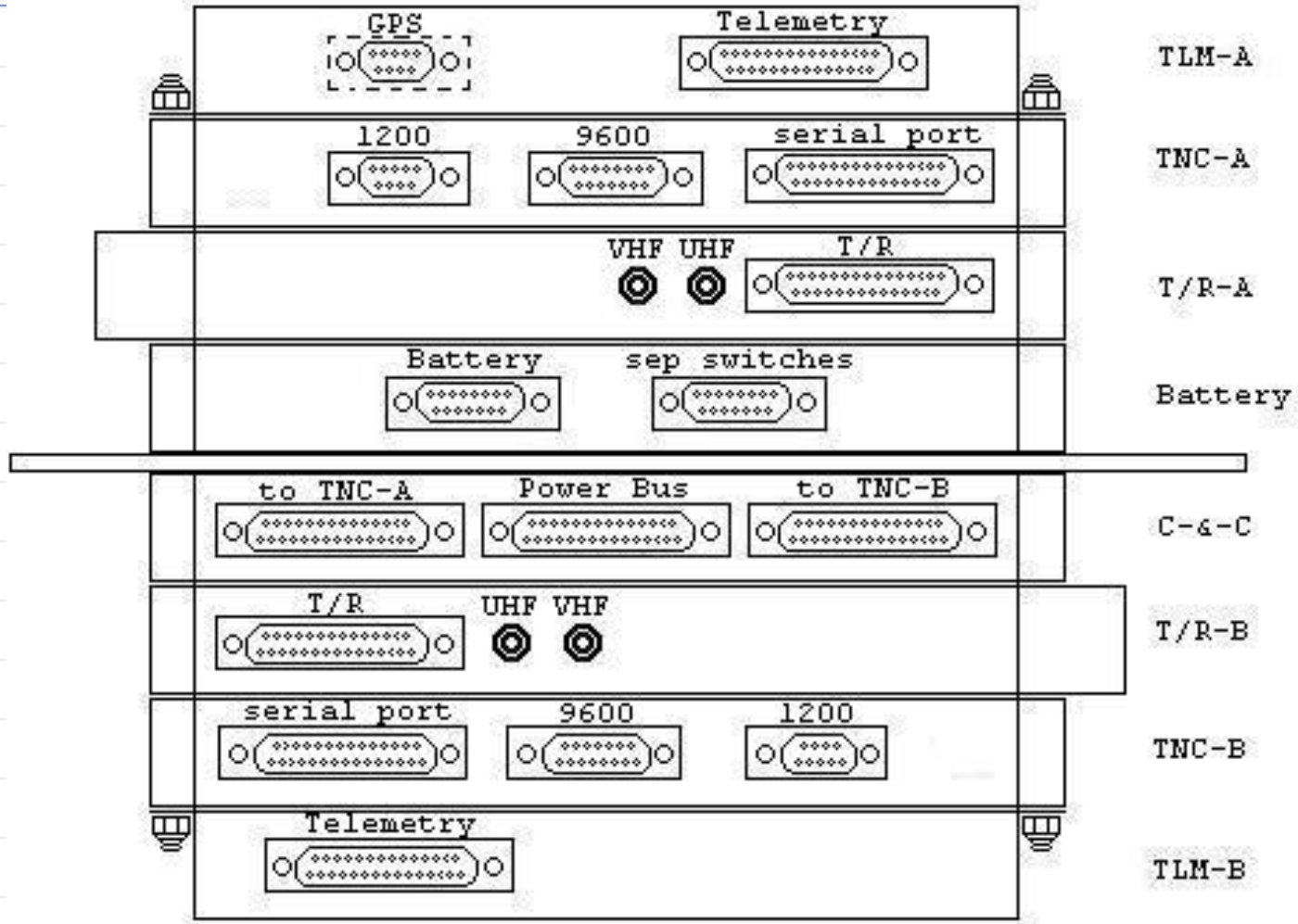
PCsat – The Build Team



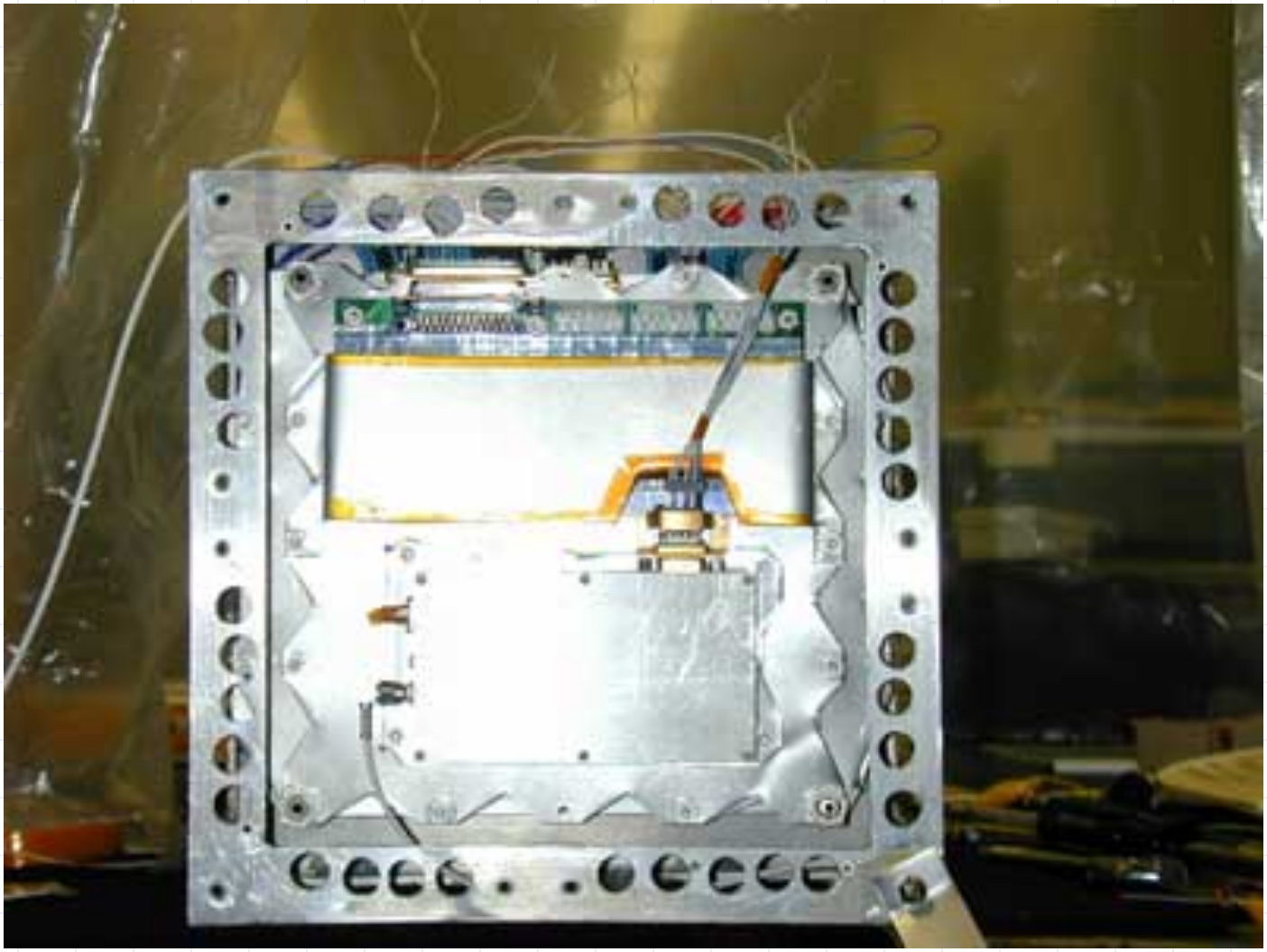
PCsat Electronics



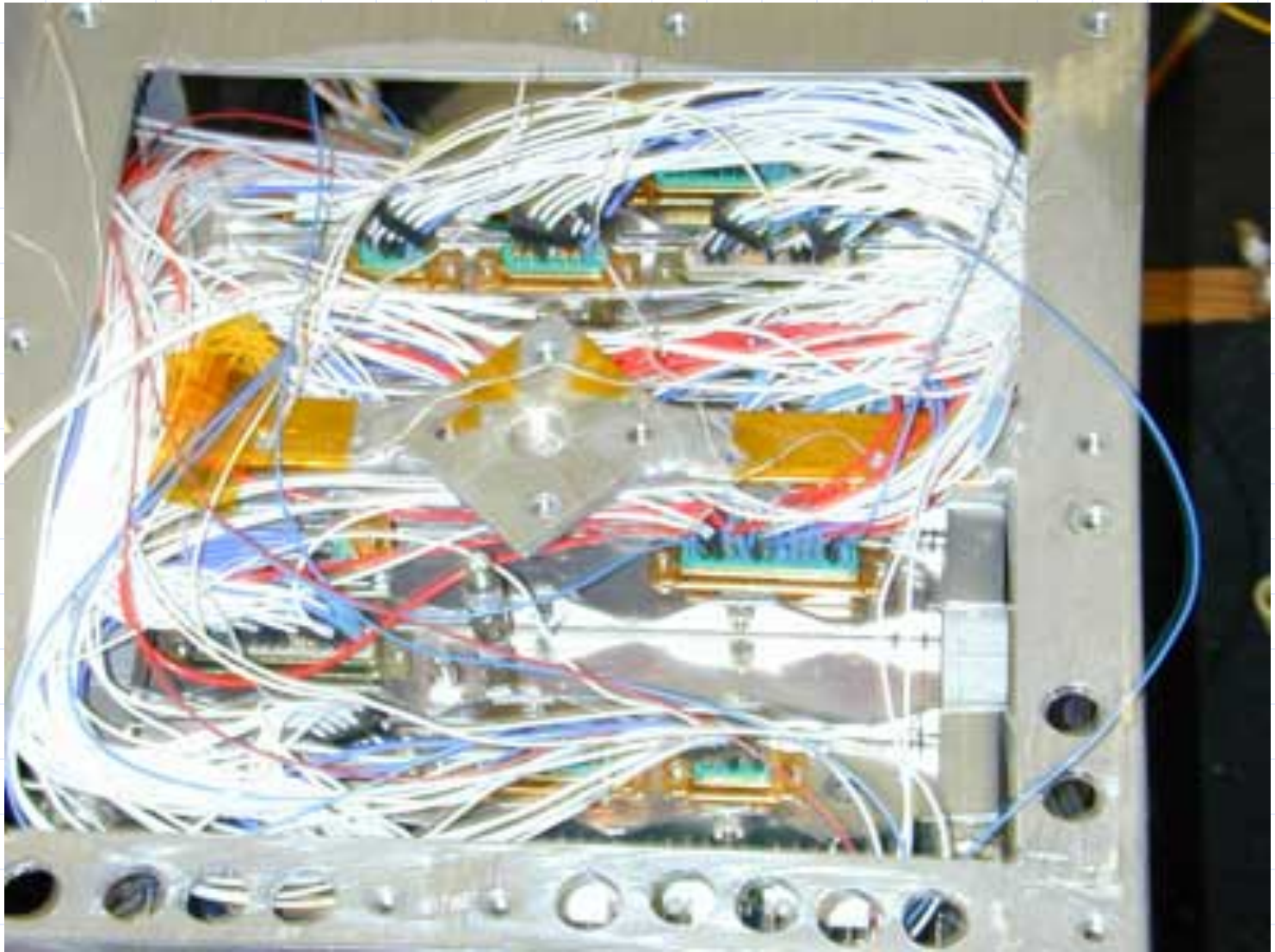
PCsat Stacking Plan



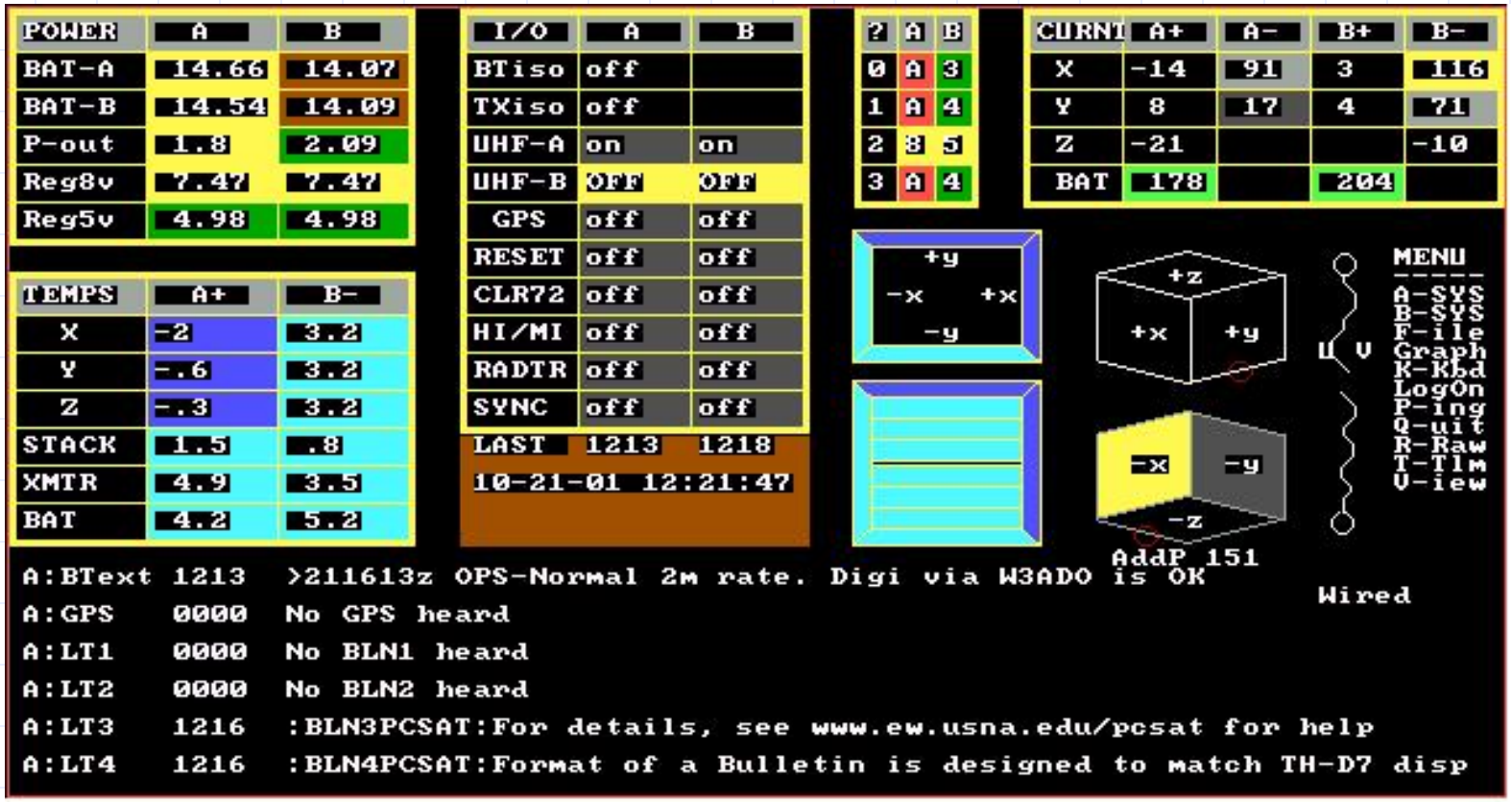
PCsat Mass Budget



PCsat –Y face (wiring harness)

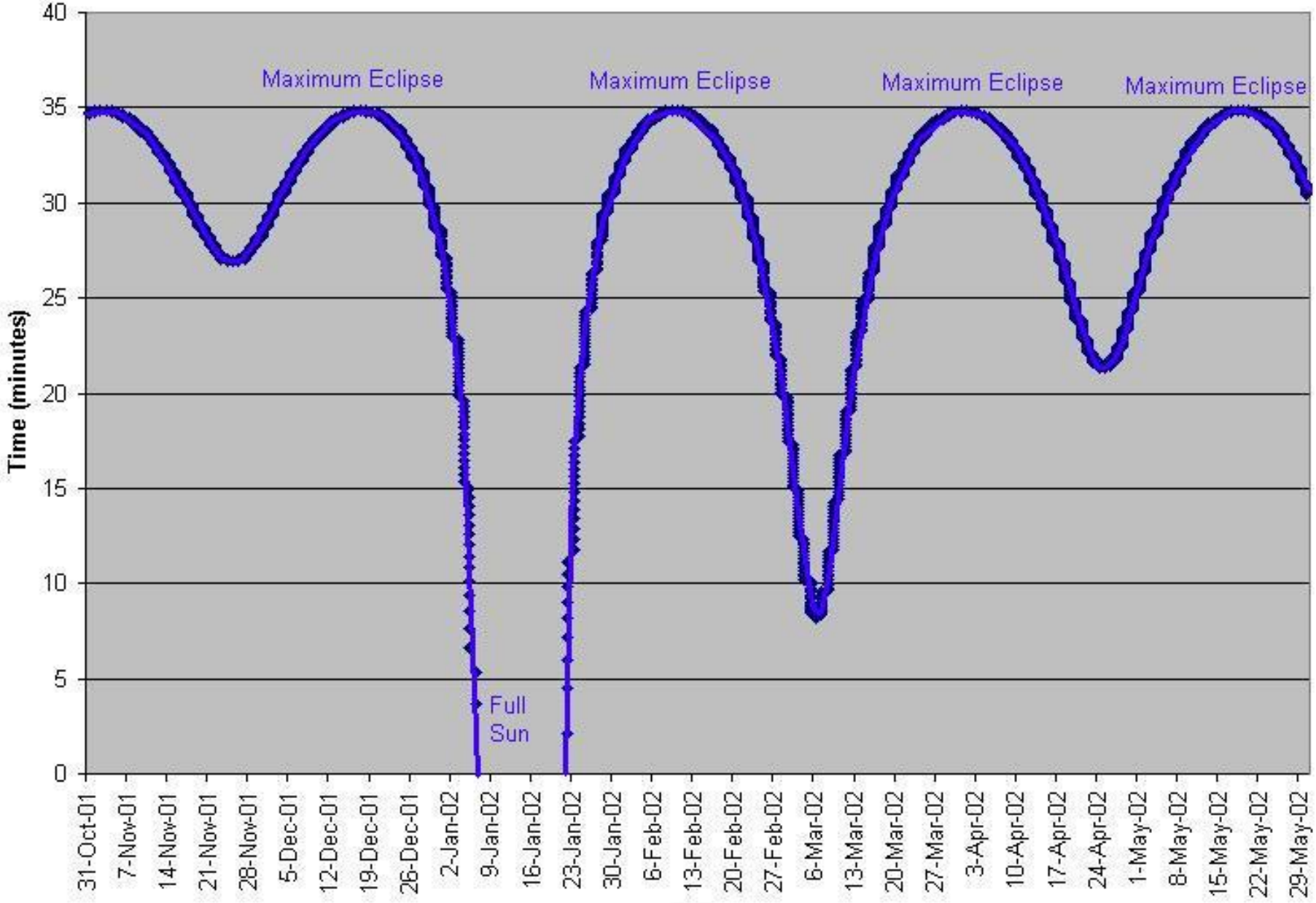


PCsat Telemetry

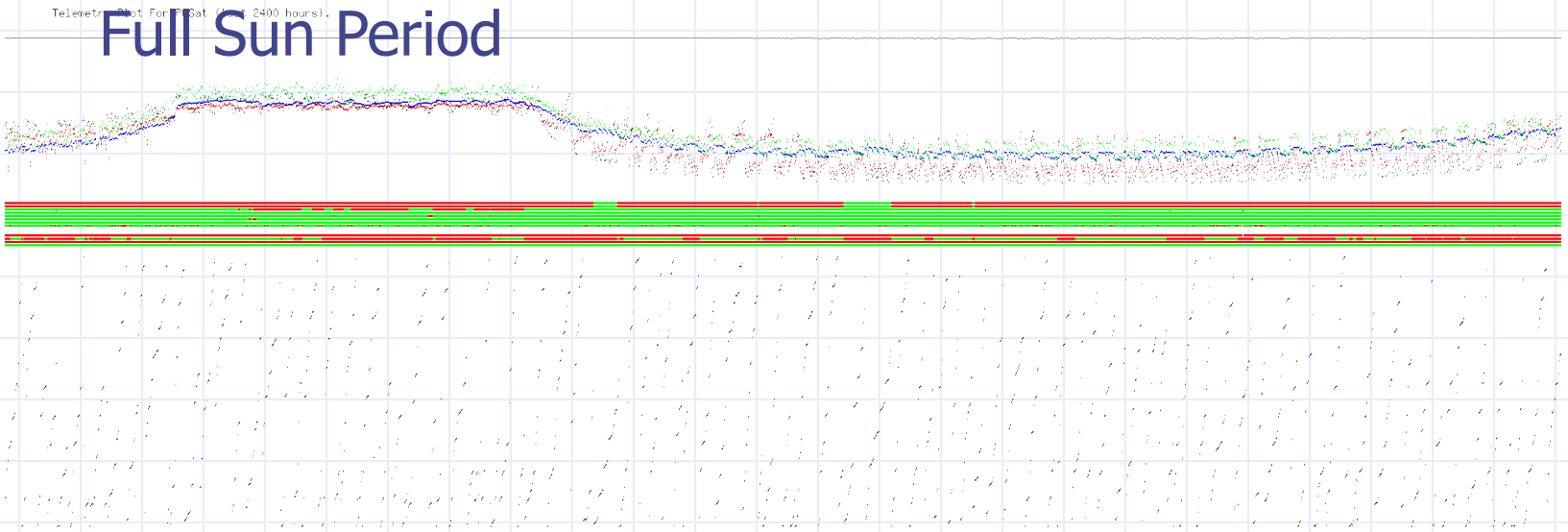


Telemetry screen of PCsat during periods of maximum eclipse cycles (35 mins eclipse, 65 mins of Sun). This snapshot was taken at 1621z on 21 Oct 2001, 20 minutes or (1/3rd) into the Sun. Notice the still cold temperatures. Also notice the low Battery voltage 14.x volts and high charge currents of 178 and 204 mA. Also the UV String experiment is separated.

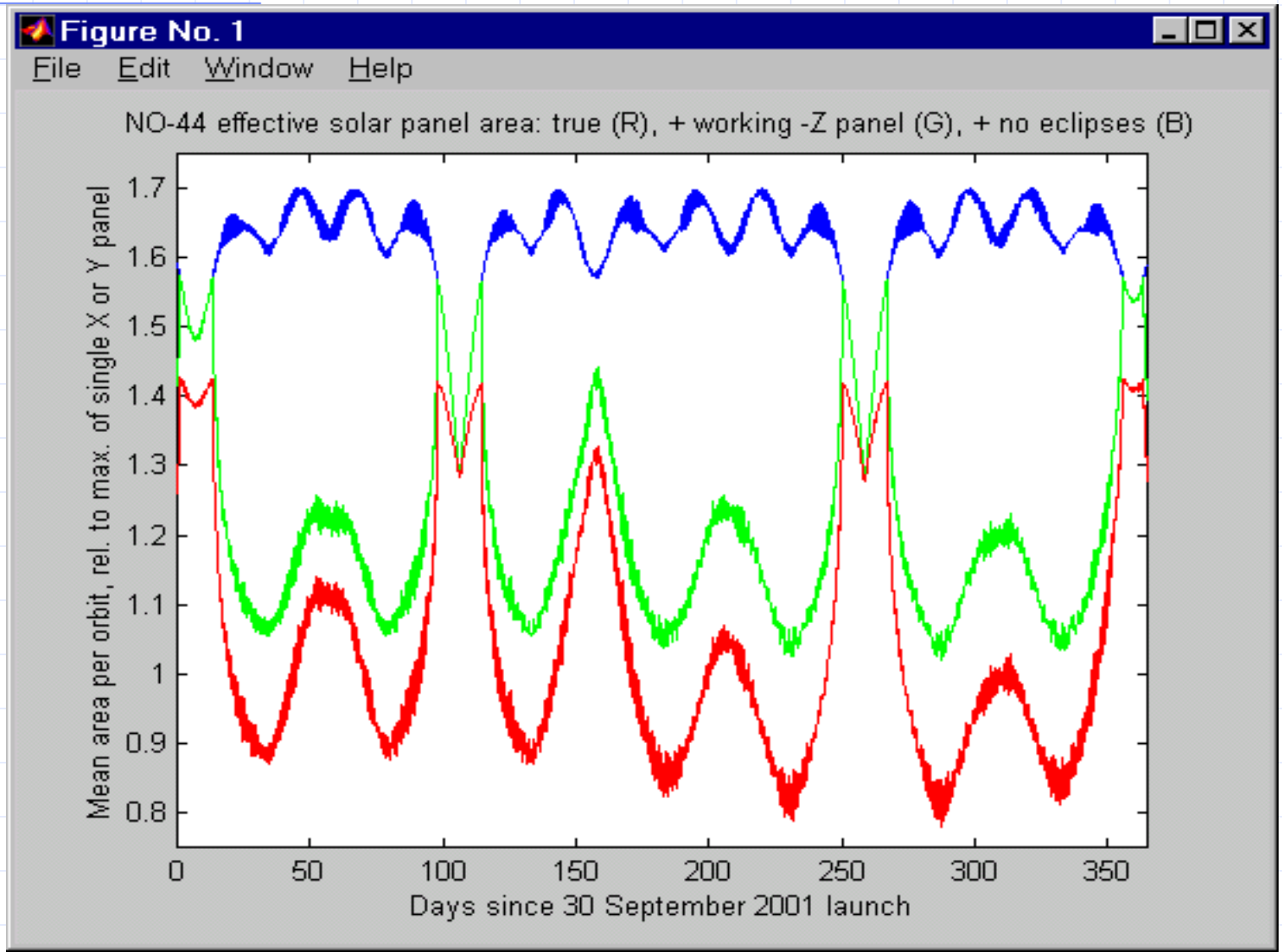
PCsat Eclipse Times in Minutes



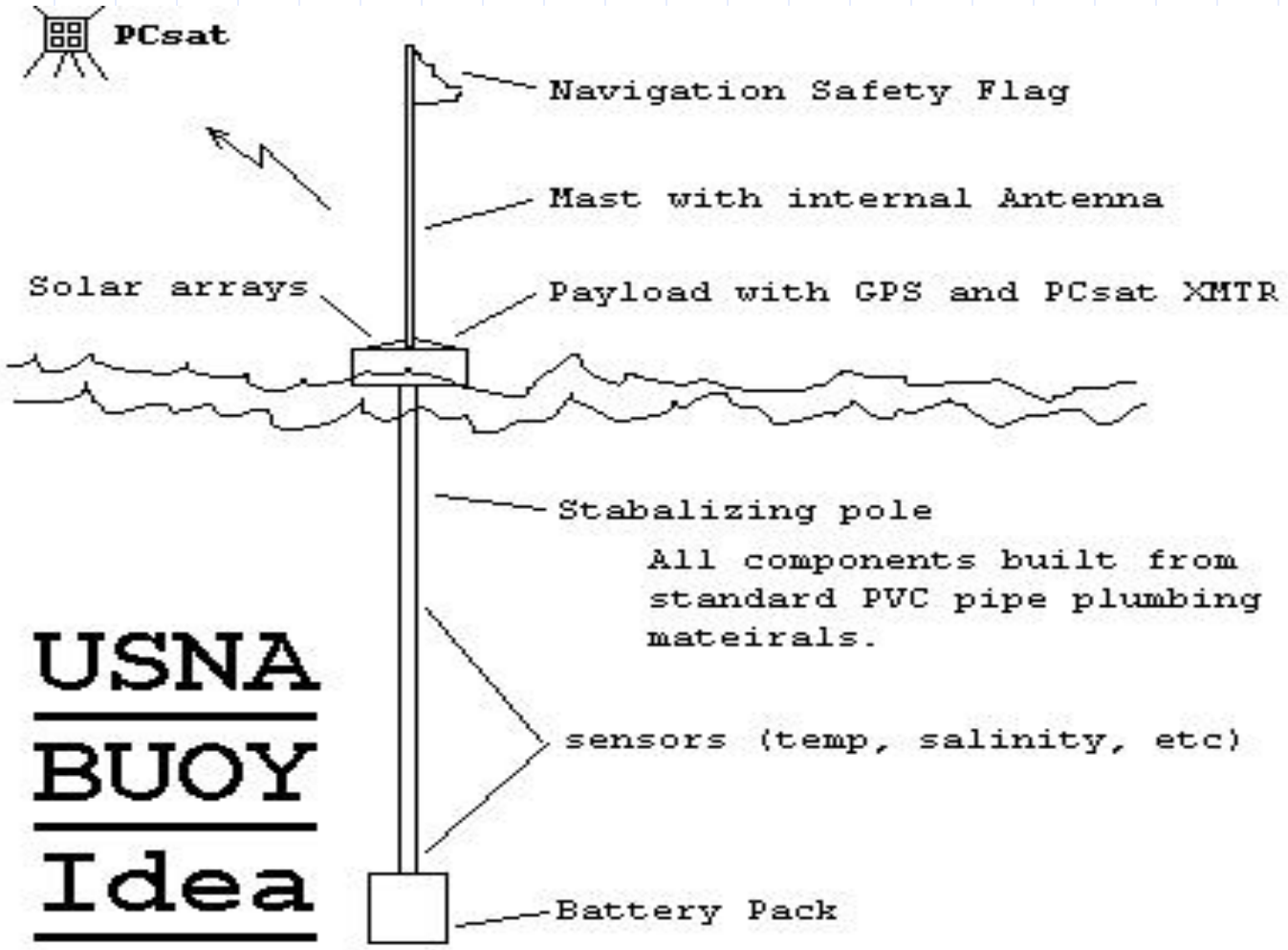
Temperature Telemetry



PCsat +Z Effect



PCsat/ISS Remote Sensors



Ultraviolet Release Experiment



Ultraviolet Release Experiment

To test the use of a polypropelene string as a means of passive release in space, PC-sat carries a string in 2 Kg tension with a telemetry switch.

This photo shows 10 identical strings to be exposed to the SUN in Arizona as a control for the experiment. One has already failed.

WB4APR

RESULTS:

All strings were prepared on 11 July 2001. Here are results of when each string broke:

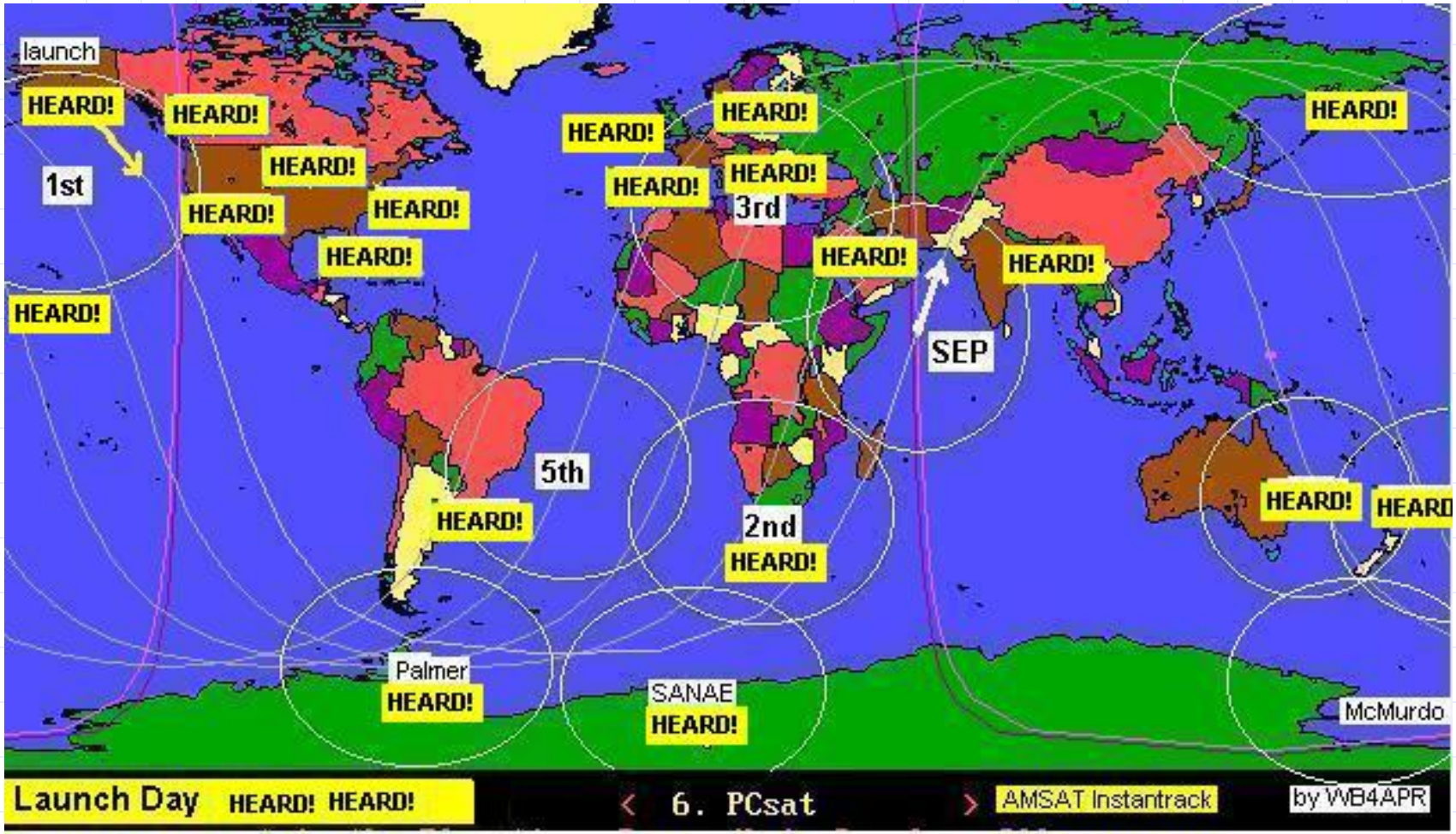
1- PCsat 28 to 40 days ndoors
1- After about 41 days indoors
1- 62 days indoors, 2 in sun
1- 62 days indoors, 8 in sun
1- 62 days indoors, 12 in sun
1- 62 days indoors, 23 in sun
5- 62 days indoors, 27 in sun

The PCsat string was found broken inside the Launcher Fairing during the final battery charge. This was the first time we had seen PCsat since integration 12 days earlier. Thus we have no data on Space UV.

Mobile Command Station



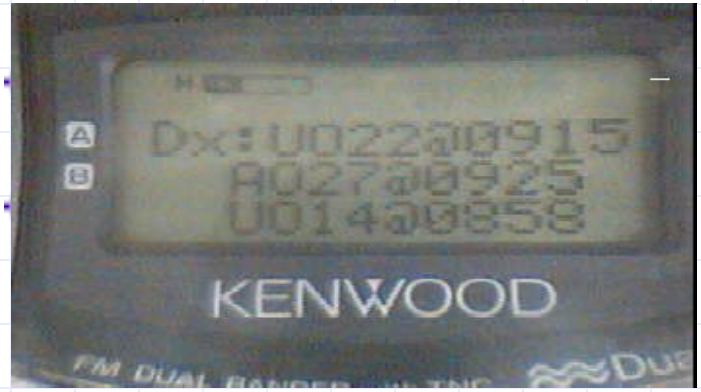
Launch Information Network

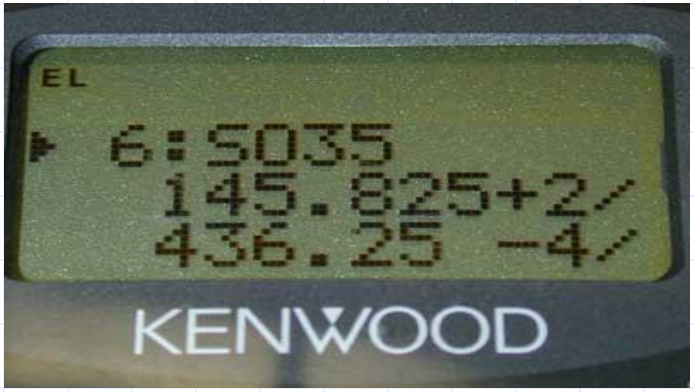


This shows the sequence of countries that will be able to hear PCsat first.

Satellite Resources on 144.39

Object





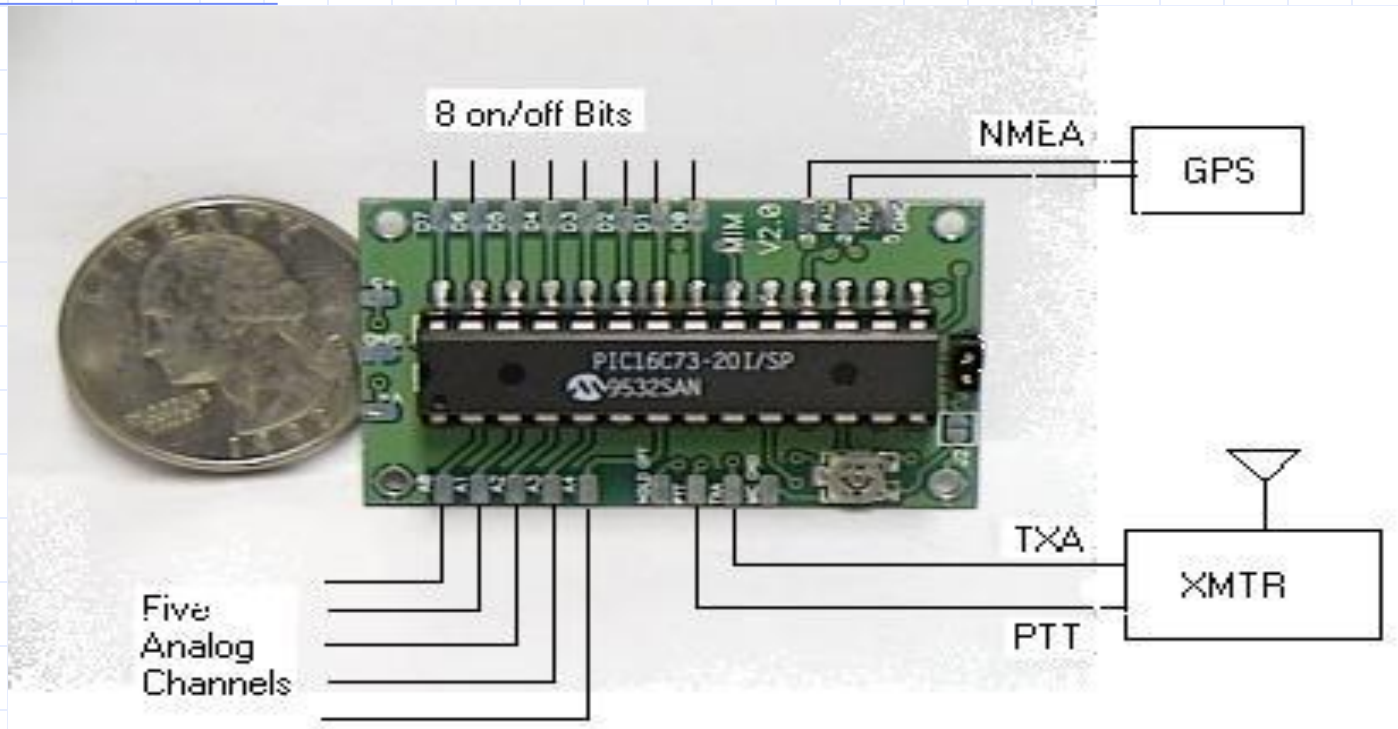
Schedule

KENWOOD walkie-talkie



AZ and distance

Smallest AX.25 Packet TLM



MIM Module as Cubesat Telemetry System

PACKET FORMATS:

BEACON TEXT:	CUBSAT>APRS:This is a Beacon Text from Cubesat every N secs
TELEMETRY:	CUBSAT>APRS:T#sss,111,222,333,444,555,bbbbbbbb
GPS POSITION:	CUBSAT>APRS:@hhmmssHDDMM.hhN/DDDMM.hhW/cse/spd
CW ID:	CWW Text sent every C seconds (optional)

Simple PCsat TLM/CMD System

(proposed)

Naval Academy Cubesat with KPC-3+ Digipeater/Telemetry

